

Notice of Allowability

Application No.

10/501,788

Examiner

Alicia M. Toscano

Applicant(s)

HASHIDZUME ET AL.

Art Unit

1712

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 7/19/04.
2. ☒ The allowed claim(s) is/are 1-8, 10-18.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 7/19/04, 10/19/04
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 20060801.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

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1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Peter Olexy on 7/31/06 and 8/3/06.

The application has been amended as follows:

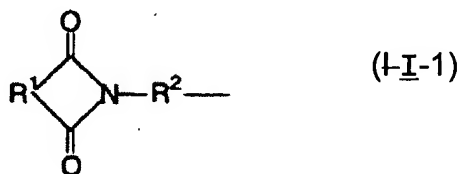
Claim 1 (Currently Amended). A film which comprises a thermoplastic composition comprising:

(A) 100 parts by weight of at least one thermoplastic resin selected from the group consisting of a thermoplastic polyester and an aromatic polycarbonate, and

(B) 0.1 to 10 parts by weight, in terms of ash content, of layered silicate having, as at least a portion of cations, an organic cation represented by the following formula (I):



wherein R is a group represented by the following formula (I-1):



wherein R¹ is a divalent hydrocarbon group having 5 to 20 carbon atoms, and R² is a divalent hydrocarbon group having 1 to 20 carbon atoms, or R is an alkyl group, an aryl

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group or an aralkyl group, L^+ is an ammonium ion, a phosphonium ion or a hetero aromatic ion, and n is an integer of 1 to 5, with the proviso that when L^+ is an ammonium ion or a phosphonium ion, n is 4 and four R s may be the same or different, and wherein at least one of the R s is the group represented by the formula (I-1).

Claim 2 (Original). The film of claim 1 which is a monoaxially or biaxially oriented film.

Claim 3 (Currently Amended). The film of claim 2, wherein in X-ray diffraction when X-ray is irradiated in a perpendicular direction of a cross section of the film, an orientation factor f which corresponds to a diffraction peak with the highest intensity among diffractions from the layered silicate satisfies the following formula (II):

$$0.6 \leq f \leq 1 \quad \dots(\text{II})$$

wherein

$$f = \frac{3\langle \cos^2 \phi \rangle - 1}{2}$$

$$\langle \cos^2 \phi \rangle = \frac{\int_0^{\pi/2} I(\phi) \cos^2 \phi \sin \phi d\phi}{\int_0^{\pi/2} I(\phi) \sin \phi d\phi}$$

ϕ represents ~~a direction~~ an azimuthal angle (degrees), and $I(\phi)$ represents diffraction intensity at the direction angle ϕ .

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Claim 4 (Original). The film of claim 2 or 3 wherein the shape of the cation-exchanged layered silicate observed from a cross section of the film satisfies the following formula (III):

$$120^{\circ} \leq (\angle ACB)_{ave} \leq 180^{\circ} \dots (III)$$

wherein A, B and C are points in one layered silicate, A and B are both end points in a longitudinal direction of the layered silicate, C is the farthest point from a straight line connecting A to B, $\angle ACB$ is an angle ($^{\circ}$) formed by the line AC and the line BC, and $(\angle ACB)_{ave}$ is the average of $\angle ACB$ which is determined from 10 layered silicates with the first to tenth largest distances between the points A and B that are contained in a cross sectional area of $10 \mu m^2$.

Claim 5 (Currently Amended). The film of claim 2 or 3, wherein the shape of the cation-exchanged layered silicate observed from a cross section of the film satisfies the following formula (IV):

$$0 \leq \sigma(\angle A^*B D^*E) \leq 16 \dots (IV)$$

wherein A and B are points in one layered silicate and end points in a longitudinal direction of the layered silicate, A*B is a straight line connecting the point A to the point B, D*E is a reference straight ~~light~~line prepared on the cross section of the film, $\angle A^*B D^*E$ is an acute angle ($^{\circ}$) formed by A*B and D*E, and $\sigma(\angle A^*B D^*E)$ is the standard deviation of $\angle A^*B D^*E$ which is determined for 10 layered silicates with the first to tenth largest distance between the points A and B that are contained in an arbitrary cross sectional area of $10 \mu m^2$.

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Claim 6 (Original). The film of claim 1, wherein the thermoplastic polyester is an aromatic polyester.

Claim 7 (Currently Amended). The film of claim 6, wherein the aromatic polyester is a poly(ethylene terephthalate), a poly(1,3-trimethylene terephthalate), a poly(1,4-butylene terephthalate) and a poly(ethylene-2,6-naphthalene dicarboxylate).

Claim 8 (Original). The film of claim 1, wherein the aromatic polycarbonate is a polycarbonate based on bisphenol A.

Claim 9 (Cancelled).

Claim 10 (Original). The film of claim 1, wherein the thickness of the layered silicate in a cross section of the film is 3 to 100 nm.

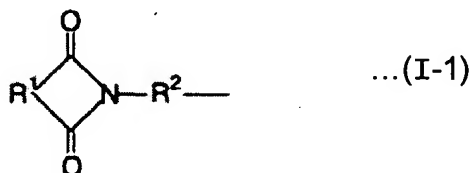
Claim 11 (Currently Amended). A thermoplastic resin composition comprising: (A') 100 parts by weight of thermoplastic resin, and (B) 0.1 to 10 parts by weight in terms of ash content of layered silicate having, as at least a portion of cations, the organic cation represented

by the formula (I):



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wherein at least one of Rs is the group represented by the formula (I-1):



wherein R^1 is a divalent hydrocarbon group having 5 to 20 carbon atoms, and R^2 is a divalent hydrocarbon group having 1 to 20 carbon atoms, or R is an alkyl group, an aryl group or an aralkyl group, L^+ is an ammonium ion, a phosphonium ion or a hetero aromatic ion, and n is an integer of 1 to 5, with the proviso that when L^+ is an ammonium ion or a phosphonium ion, n is 4 and four Rs may be the same or different.

Claim 12 (Currently Amended). The composition of claim 11, wherein the layered silicate has the organic cation such that a cation exchange percentage (%) represented by the following formula (VI) is 50 to 200 % -

$$\text{Cation Exchange Percentage (\%)} = \{W_f / (1 - W_f)\} / (M_{\text{org}} / M_{\text{si}}) \times 100 \dots \text{(VI)}$$

(W_f represents a weight reduction ratio of the layered silicate measured by a thermogravimetric analysis from 120°C to 800°C at a temperature increasing rate of 20°C/min, M_{org} represents the molecular weight of the imidazolium ion, and M_{si} represents a molecular weight of the layered silicate per charge, where T the molecular

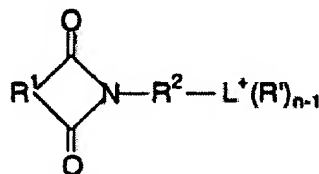
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weight per charge in the layered silicate is a value calculated by a reciprocal of the cation exchange capacity, (unit: gram equivalent or eq/100 g) of the layered silicate.)

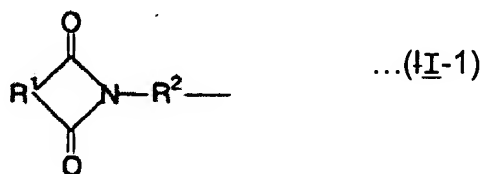
Claim 13 (Original). The composition of claim 11, wherein the layered silicate has a thermal decomposition temperature of not lower than 310°C.

Claim 14 (Original). The composition of claim wherein the layered silicate is smectite, vermiculite or mica in which at least a portion of cations has been replaced by the organic cation.

Claim 15 (Currently Amended). A layered silicate having, as at least a portion of cations, an organic cation represented by the following formula:



wherein R¹ is a divalent hydrocarbon group having 5 to 20 carbon atoms, R² is a divalent hydrocarbon group having 1 to 20 carbon atoms, R' is a group represented by the formula (I-1):



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wherein R^1 and R^2 are the same as defined above, an alkyl group, an aryl group or an aralkyl group, L^+ is an ammonium ion, a phosphonium ion or a hetero aromatic ion, and n is 1 to 5.

Claim 16 (Currently Amended). The silicate of Claim 15, which has the organic cation such that a cation exchange percentage (%) represented by the following formula (VI) is 50 to 200—

$$\text{Cation Exchange Percentage (\%)} = \{W_f / (1 - W_f)\} / (M_{\text{org}} / M_{\text{si}}) \times 100 \dots \text{(VI)}$$

(W_f represents a weight reduction ratio of the layered silicate measured by a thermogravimetric analysis from 120°C to 800°C at a temperature increasing rate of 20°C/min, M_{org} represents the molecular weight of the imidazolium ion, and M_{si} represents a molecular weight of the layered silicate per charge, where $\frac{1}{M_{\text{si}}}$ the molecular weight per charge in the layered silicate is a value calculated by a reciprocal of the cation exchange capacity, (unit: gram equivalent or eq/100 g) of the layered silicate.)

Claim 17 (Original). The silicate of claim 15, which has a thermal decomposition temperature of not lower than 310°C.

Claim 18 (Original). The silicate of claim 15, which is smectite, vermiculite or mica in which at least a portion of cations has been replaced by the organic cation.

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2. The following is an examiner's statement of reasons for allowance: a cation of formula (I) and (I-1) are not suggested nor disclosed in the prior art of record for use in thermoplastic resins. Imai et al (Chem Mater 2002, 14, 477) disclose novel cations as compatibilizers for clay-polymer materials. Said compatibilizers do not suggest or disclose cations which have imide or imide-type functionalities, as required by Claim 1. Leu et al (Chem Mater 2002, 14, 3016) disclose a covalently bonded layered silicate. The bound tether on the clay silicate is a polyimide polymer. The structure of the polyimide does not meet the requirements for Claim 1 (it is missing a L^+ group and it has more than 20 carbons in its chain). Morgan et al (Macromolecules 2001, 34, 2735) disclose a polyetherimide nanocomposite. Said composite has a imide cation "tether", (Figure 1). Though the structure of the cation is similar, group R^1 it is not a short chain 5-20 carbon hydrocarbon, rather it is a polyetherimide chain, thus it doesn't meet the limitations for Claim 1. Yonezawa (US 200/40053061) discloses a material for insulating substrate comprising 100 parts thermoplastic resin and 0.1 to 100 parts by weight of layered silicate. The silicate under goes cation exchange with quaternary ammonium salts [0086], however it does not suggest or disclose the use of the cation of Claim 1 of applicants.


Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alicia M. Toscano whose telephone number is 571-272-2451. The examiner can normally be reached on Monday to Friday 8:30 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AMT



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